**Partnership for Reviving Routine
Immunisation in Northern Nigeria;
Maternal Newborn and Child Health Initiative**

Nahuche Health and Demographic Surveillance System: February 2012 Update
Operations Research Unit, Kano

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Background

In 2009, the PRRINN-MNCH Programme with funding from the Norwegian Government, set up the Nahuche Health and Demographic Surveillance System (HDSS), a longitudinal health and population registration system established to monitor health and demographic dynamics in Nahuche emirate in Bungudu Local Government Area of Zamfara State. The Nahuche HDSS has been implemented by the PRRINN-MNCH Programme in collaboration with the Zamfara State Ministry of Health to support studies aimed at assessing the wider progress and impact of strengthening health systems by monitoring health and demographic events and populations at risk over time.

The Nahuche HDSS site is 32 kilometres from the state capital, Gusau, and is constituted of six districts: Bella, Gada, Karakai, NahucheKeku, NahucheUbandawaki and Rawayya. Virtually all members in the study area are Hausa by ethnicity, traders, and practice subsistence farming.

The key objectives of Nahuche HDSS are to:

(a) monitor health and population changes;
(b) studyinterlinkages between Maternal Newborn and Child Health service strategies and survival, and
(c) monitor and evaluate the impact of health and livelihood intervention programmes.

Key activities during 2010-2011

A number of activities were completed during 2010-2011 such as:

(a) mapping, compound listing and household numbering;
(b) pilot census activities to test data collection and computing systems;
(c) a full baseline census for all the six districts of the HDSS;
(d) round 1 update of events (collection of information on births, deaths, and migration) including collection of information on maternal and child health indicators; and
(e) round 2 update of events (collection of information on births, deaths, migration, pregnancy observation, and marriage.

The full baseline census

The baseline census was conducted between September and December 2010 (Round 0). The HDSS sought a population large enough to detect events such as neonatal deaths within short intervals of time. The baseline census questionnaire collected information on names of household members, relationship to head of household, residence status, sex, date of birth, ethnicity, marital status, education, survival status of parents and household characteristics. The fieldworkers interviewed the head of the household or a designated adult. A maximum of three revisits were carried out, following which a non-response was recorded. Beginning in January 2011, trained interviewers visited compounds within the HDSS site in 120-day work cycles (*aka* 'round'), recording events in registers, and reporting data to the Nahuche HDSS computer center for processing.

Within the HDSS structure, compounds or dwelling units (DUs) are grouped into clusters. This will provide an important opportunity to deploy selected interventions within selected clusters to allow for comparison. Worldwide, the number of DUs per cluster in HDSS sites varies. It is based on what is subjectively considered manageable. As a result, the 100 demarcated clusters are different in terms of size and number of compounds or DUs. A total of 8,238 compounds were listed in these clusters and the target was to visit all of the identified households in all of the clusters.

Household population and characteristics
The Nahuche HDSS enumerated a baseline population of 125,149 in 19,193 households. A majority of the households were in Gada(21.7%) followed by Rawayya (19.9%), Bella (17.5%),

Nahuche-Keku (15.6%), Nahuche-Ubandawaki (14.1%) and Karakai (11.7%). The average number of persons per household was 6.5 ranging from 5.6 in Karakai to 6.9 each in Nahuche-Ubandawaki and Rawayya.

The distribution of the de jure (usual residents) population in the 2010 baseline census is presented in Table 1. About half (49.9%) of the population was female, representing a sex ratio (males/100 females) of almost unity. The results show that the household population had a greater number of younger people than older people (see summary in Figure 1). About 51% of the total population was under 15 years of age while 3% was 65 years or older. The average age was 19.6 years.

Table 1: Selected characteristics of 125,149 individuals, Nahuche baseline census, 2010

Characteristics	Number
De jure population size[a]	125,149
Male	62,760
Female	62,389
Ratio male to female	1.01
Number of households	19,193
Mean household size[b]	6.5
% under five years	20.4
% under 15 years	50.9
% 65+ years	3.0
Mean age (years)[c]	19.6
Median age (years)	14.0

Notes: [a]De jure population: the permanent population plus temporary migrants. These are people who usually stay in the household for 3 or more months each year. [b]Based on de jure population. [c]Minimum age in years is 0 and maximum is 115.
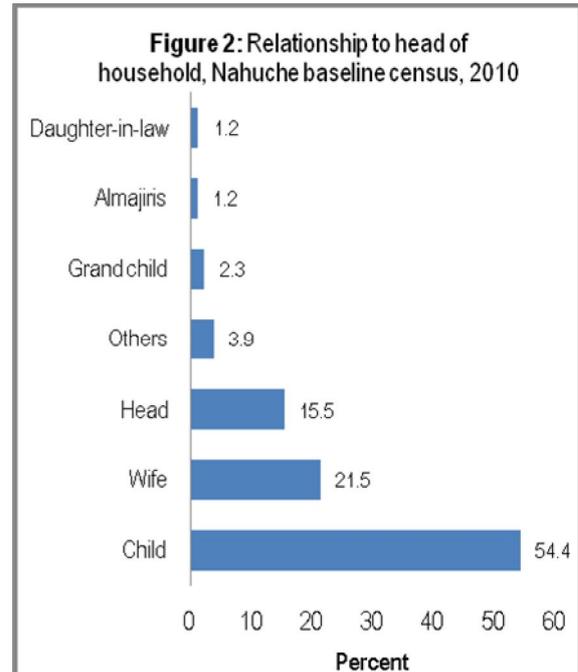
Figure 1: Percentage distribution of population by 5-year age groups, Nahuche baseline census, 2010

Figure 2: Relationship to head of household, Nahuche baseline census, 2010

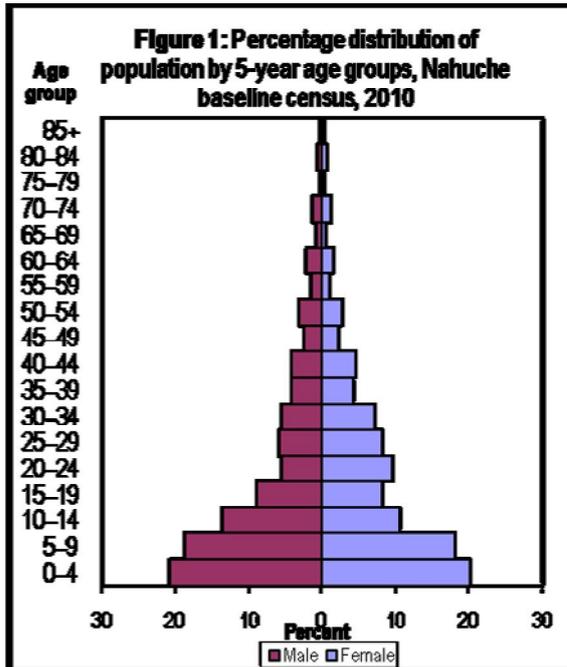| Relationship	Percent
Daughter-in-law	1.2
Almajiris	1.2
Grand child	2.3
Others	3.9
Head	15.5
Wife	21.5
Child	54.4

Figure 2 displays the relationship to the head of the household of all the members enumerated in the 19,193 households. The predominant relationship was that of a child representing 54.4% of the household members followed by 21.5% of the members who were wives to the head. These households were headed by 15.5% of the de jure population with 3.9% classified as "other" relationships. Another 2.3% of the household members were residing with grandchildren and 1.2% being *Almajiris*, that is, children who are taught the Islamic religion. The *Almajiris* are known to come from as far as Niger Republic. A similar percentage of households were staying with daughter-in-laws.

Round 1: Maternal mortality estimates

As part of round 1 (i.e., Jan-June 2011) activities, data were collected from women of reproductive age in 17,173 households using a structured questionnaire which focused on a number of maternal and child health seeking behavior topics as well as the sisterhood questions. A maternal death was defined as the death of a woman during pregnancy, childbirth, or in the 42 days after delivery. Where identification of the cause of death becomes problematic, another index is used namely "pregnancy related deaths." The difference between pregnancy related deaths and maternal deaths is that the former includes all causes of deaths. The latter is simpler to measure with the aid of sisterhood method and provides a reasonable estimate of maternal mortality. The reproductive age for estimating maternal mortality using the sisterhood method includes women aged 15-49 years although in some countries with incidence of early marriages, those aged 13 years are also included.

The inclusion criteria for reported sisters was that they were born to the same mother as the respondent and had reached reproductive age (15 years). The specific questions for employing the sisterhood method were as follows: 1) How many sisters have you ever had who reached reproductive age (15 years?); 2) How many of these sisters are alive?; 3) How many of these sisters are dead?; and 4) How many of these sisters died during pregnancy, labor or within 42 days after the delivery? Further technical details on the application of the sisterhood method to the Nahuche HDSS round 1 data have been reported elsewhere (Doctor et al. 2012).

Results from the maternal mortality analysis shows that a total of 17,087 respondents who were interviewed reported 38,761 maternal sisters of reproductive age (15-49 years). Out of the 38,761 sisters, 3,592 were reported dead and 1,261 of those dead were maternal deaths. The total lifetime risk of maternal death was 8% and using 7.5 as the total fertility rate for Zamfara State, the estimated maternal mortality ratio(MMR) for the surveillance site was **1,049 deaths per 100,000 live births** (95% Confidence intervals as (1 021, 1 136)).

Conclusion
The Nahuche HDSS is monitoring longitudinal health and demographic dynamics under exceedingly complex circumstances. Cultural factors restrain married women from being interviewed by men, low levels of educational attainment result in largely male-dominated fieldworker teams, and age distortions and other biases occur in the recall of information. Despite these essential difficulties, information was and will be recorded, edited and reported on population dynamics in a large population.

Findings from the baseline census showed a largely young population. The analysis of data from round 1 also provide evidence-based information on maternal mortality in a northern Nigeria setting. Further, the study compliments some of the previous MMR figures which have generally been speculative with reference to MMR being "over 1,000 deaths per 100,000 live births."The Nahuche HDSS baseline census and update round activities have demonstrated the replication of surveillance technology in a resource-constrained environment and become a model for other longitudinal health and demographic research projects in Nigeria. Nahuche has not only replicated a capacity for conducting longitudinal research; it has developed a platform for testing feasible interventions as we draw closer to the Millennium Development Goals.

Reference
Doctor HV., A. Olatunji, S.E Findley, G.Y. Afenyadu, A. Abdulwahab, and A. Jumare. 2012. Maternal mortality in northern Nigeria: findings from a health and demographic surveillance system in Zamfara State. PRRINN-MNCH Programme, mimeo.

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Selected photographs from Nahuche HDSS

Oriade HDSS (Osun State, Nigeria) team and some staff from PRRINN-MNCH and Zamfara SMOH on a learning visit to Nahuche HDSS and Zamafara SMOH (August 2011).

From L-R: Alabi Olatunji (HDSS Manager), Allison Goldberg (PhD student from Columbia University, Mailman Sch of Public Health), and Abdulazeez Jumare (HDSS Data Manager) during Ms. Goldberg's fieldwork on research exploring the role of social networks in influencing immunization uptake in the surveillance area (Oct-Nov 2011).